

English Translation of Annexes to IPER of PCT/EP00/08828

Patent Claims

1. A method for heat treating a cast, homogenized and subsequently cooled metallic extrusion bolt or - when hot shears are used - slug, preferably made of a light metal alloy, immediately before it is fed into the extruder,
- a) wherein the extrusion bolt/slug (1) is reheated,
 - 5 b) the reheated extrusion bolt/slug (1) is subsequently cooled, and
 - c) is delivered to the extrusion device, characterized in that
 - d) the extrusion bolt/slug (1), based on a diameter of 200mm, is reheated to the desired temperature in 20 minutes at most, and in that
 - 10 e) the reheated extrusion bolt/slug (1) is exposed to passive temperature equalization for 3 minutes at most,
 - f) said temperature equalization resulting in a temperature uniformity, based on a diameter of 200mm, of less than $\pm 10K$.
- 15 2. A method for heat treating a cast, homogenized and subsequently cooled metallic extrusion bolts or - when hot shears are used - slug, preferably made of a light metal alloy, before it is fed into the extruder,
- a) wherein the extrusion bolt/slug (1) is reheated,
 - b) the reheated extrusion bolt/slug (1) is subsequently cooled, and
 - 20 c) is delivered to the extrusion device, characterized in that
 - d) the reheated extrusion bolt/slug (1) is exposed to rapid cooling using water spray nozzles (25), such that - based on a diameter of 200mm - a temperature at least 150K below the extrusion temperature is set on the surface of the extrusion bolt/slug (1) within a nozzle spraying period of 30 seconds at most, and in that
 - 25 e) the desired temperature distribution is set in the extrusion bolt/slug (1), both over its cross-section and along its length, by the end of a

temperature equalization period which is longer than the nozzle spraying period.

3. The method for heat treating an extrusion bolt/slug (1) as set forth in
5 any one of claims 1 or 2, characterized in that the extrusion bolt/slug (1) is heated to the highest optimal temperature for the respective alloy, and at an extrusion temperature which is lower than this temperature due to the requirements of the extrusion process is rapidly cooled following said heating, wherein the extrusion bolt/slug (1) is cooled such that after an active cooling period and a following
10 temperature equalization period it exhibits the desired, lower extrusion temperature, in particular when a so-called temperature taper is generated while cooling from the highest optimal temperature for the respective alloy to the lower extrusion temperature required for the extrusion process.

4. A method for heat treating an extrusion bolt/slug, characterized in
15 that the extrusion bolt/slug is heated in a first part (7) by gas burner flames which contact the surface, and in a second part (8) by forced convection by means of hot gas nozzle jets blown onto the surface of the material, and in that the last sub-section (8b) of heating by forced convection substantially serves to equalize
20 the temperature in the material and is operated with only a low excess temperature as compared to the end temperature.

5. A method for heat treating an extrusion bolt/slug, characterized in
that - directly following a preceding rapid heating - rapid cooling is anticipated
25 using individual water spray nozzles (25) whose axes are radially directed towards the horizontal axis of the material and which may be operated, individually or in groups, at different pressures and/or with different activation times.

6. The method as set forth in any one of claims 1 to 5, characterized in
30 that demineralized water is used as the cooling fluid.

7. A device for heat treating a cast, homogenized metallic extrusion bolt or - when hot shears are used - slug, preferably made of a light metal alloy, immediately before it is fed into the extruder,
- a) comprising a heating device (7, 8) and
 - 5 b) comprising a cooling device, characterized in that
 - c) the heating device comprises a first part (7) using heating by gas burner flames which contact the surface, and a second part (8) using heating by forced convection by means of hot gas nozzle jets blown onto the surface of the material,
 - 10 d) wherein the last (in the direction of material transport) sub-section (8b) of heating by forced convection substantially serves to equalize the temperature in the material and is operated with only a low temperature above the end temperature.
- 15 8. A device for heat treating a cast, homogenized metallic extrusion bolt or - when hot shears are used - slug, preferably made of a light metal alloy, immediately before it is fed into the extruder, characterized in that
- a) the cooling device serves to rapidly cool the reheated extrusion bolt/slug (1) using individual water spray nozzles (25),
 - 20 b) whose axes are radially directed towards the horizontal axis of the material, and
 - c) which may be operated, individually or in groups, at different pressures and/or with different activation times.
- 25 9. A device for heat treating a cast, homogenized metallic extrusion bolt or - when hot shears are used - slug, preferably made of a light metal alloy, immediately before it is fed into the extruder, characterized in that
- a) the burners used are recuperation burners in which the recuperator for preheating the combustion air is individually integrated into each
 - 30 burner respectively, and

- b) the burner jets exit the burner nozzle at a high velocity, wherein in particular at least a few recuperation burners can be operated in floc mode.

5 10. The device as set forth in at least one of claims 7 to 9, characterized in that the nozzles of the recuperation burners (22) are fitted with dies made of a material with high temperature stability, to alter the cross-section of the burner jets (24), wherein in particular the nozzles of the recuperation burners (22) change the direction of the burner jets (24) and/or the dies divide the burner jets
10 (24) up respectively into at least two individual jets.

 11. The device as set forth in at least one of claims 7 to 10, characterized in that the extrusion bolt or slug (1) is in a fixed position in the rapid cooling device during the cooling process, said rapid cooling device consisting of
15 annular arrangements of individual nozzles (25), wherein in particular each group of nozzles is formed by the nozzles of an annular arrangement of nozzles and/or the nozzles exhibit different sizes according to their orientation with respect to the shell surface of the bolt.

20 12. The device as set forth in at least one of claims 7 to 11, characterized in that during the cooling process, the bolt is held by a clamp mounting (34) which grips the facing sides of the bolt and may be set to various bolt lengths, and which in particular comprises catches (34c) on the lower face of the bolt, for additionally securing the bolt through a positive lock.

25 13. The device as set forth in claim 12, characterized by a loading/unloading position for the clamp mounting (34), before the cooling means.

 14. The device as set forth in any one of claims 7 to 13, characterized in
30 that the cooling period is different for the individual groups of nozzles, wherein in particular a period of time for temperature equalization follows the cooling period.

15. The device as set forth in at least one of claims 7 to 14, characterized in that - for short times per bolt - at least two cooling devices are operated in parallel.

5 16. The device as set forth in any one of claims 7 to 15, characterized in that the nozzles of the rapid cooling device are supplied with cooling fluid from a pressure accumulator.